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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------------------------------------------------------------------|-------------|----------------------|-------------------------|------------------|
| 10/726,995 | 12/02/2003 | Andrew J. Ouderkirk | 59415US002 | 4511 |
| 32692 | 7590 | 09/30/2005 | EXAMINER | |
| 3M INNOVATIVE PROPERTIES COMPANY PO BOX 33427 ST. PAUL, MN 55133-3427 | | | KEANEY, ELIZABETH MARIE | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2882 | |

DATE MAILED: 09/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary

Application No.

10/726,995

Applicant(s)

OUDERKIRK ET AL.

Examiner

Elizabeth Keaney

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>11/29/04; 8/15/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

Claims 17 and 20 are objected to because of the following informalities:

- Claim 17: "phosphor material,"; should be --phosphor material.--
- Claim 20 recites the limitation "a second multilayer interference reflector" however a first multilayer interference reflector is not present in the claims.

Appropriate correction is required.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-19 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims

1,2,3,4,8,9,10,11,12 and 13 of copending Application No. 10/726968 (hereinafter '968).

Although the conflicting claims are not identical, they are not patentably distinct from

each other because the claims of the instant application are broader than the claims of application '968 and therefore are anticipated thereby. For example:

- Claim 1 of the instant application is anticipated by claim 1 of '968.
- Claim 2 of the instant application directly corresponds to claim 2 of '968.
- Claim 3: It is well within ordinary skill in the art for an adhesive to contain phosphor material in order to deposit the material in layer form.
- Claim 4 of the instant application directly corresponds to claim 3 of '968.
- The remaining claims directly correspond to each other and will not further be individually specified.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 1-3 and 5-19 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of copending Application No. 10/726997 (hereinafter '997). Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant application is an obvious variation of '997. For example:

- It would have been obvious to one of ordinary skill in the art to combine the various features of claims 1,2 and 12 to produce the claimed invention of claim 1 of '997 in order to provide for the greatest patent protection.
- Claim 3 of the instant invention directly corresponds to claim 4 of '997.
- Claim 5 of the instant invention directly corresponds to claim 2 of '997.

- The remaining claims directly correspond to each other and will not further be individually specified.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 1-26 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-33 of copending Application No. 10/727,026 (hereinafter '026). Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of the instant application are broader than the claims of application '026 and therefore are anticipated thereby. For example:

- Claims 1 and 20 are anticipated by claims 1 and 18 of '026.
- Claim 2 directly corresponds to claim 2 of '026.
- Claim 3: It is well within ordinary skill in the art for an adhesive to contain phosphor material in order to deposit the material in layer form.
- Claim 4 directly corresponds to claim 3 of '026.
- The remaining claims directly correspond to each other and will not further be individually specified.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 1-19 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of copending Application No. 10/727,072 (hereinafter '072). Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of the instant application are broader than the claims of application '072 and therefore are anticipated thereby. For example:

- Claim 1 of the instant application is anticipated by claim 1 of '072.
- Claim 2 of the instant application directly corresponds to claim 2 of '072.
- Claim 3: It is well within ordinary skill in the art for an adhesive to contain phosphor material in order to deposit the material in layer form.
- Claim 4 of the instant application directly corresponds to claim 3 of '072.
- The remaining claims directly correspond to each other and will not further be individually specified.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1,2,5,6,9,10,11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (US Patent 6,155,699; hereinafter Miller) in view of Fleming et al. (US Patent 6,172,810; hereinafter Fleming).

Re claim 1: Miller discloses, in figures 2 and 3 and throughout the disclosure, a light source comprising:

- an LED (12) that emits excitation light;
- a first multilayer reflector (32,34) that reflects at least a portion of visible light and transmits the excitation light (column 6, lines 17-18; column 6, line 42); and
- a layer of phosphor material (36) adjacent the multilayer reflector, the phosphor material emitting visible light when illuminated with excitation light.

Miller further discloses the multilayer reflector to be a DBR mirror comprised of alternating layers of TiO_2 and SiO_2 .

However, Miller fails to teach or fairly suggest the multilayer reflector being flexible.

Fleming teaches the substitution of a flexible polymeric multilayer reflector for that of a reflector comprised of alternating layers of TiO_2 and SiO_2 (column 2, lines 5-8; column 6, lines 21-39; column 8, lines 1-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the reflector of Fleming for that of Miller because it reduces the cost of the reflector when higher refractive indices are unnecessary.

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Re claim 2: Fleming discloses the flexible multilayer reflector comprising polymeric material (column 5, line 17).

Re claims 5 and 6: Miller discloses the use of a Gallium Nitride (GaN) die (column 5, lines 14-15). Miller further discloses that the GaN die is configured to emit primary light having a peak wavelength in the blue region. The Examiner notes that while Miller only addresses the peak wavelength emitted by the die, other wavelengths are also present, particularly UV rays. Therefore, Miller discloses excitation light comprising blue and UV light.

Re claim 9: Fleming discloses the first flexible multilayer reflector is a polymeric material substantially free of inorganic materials (column 7, lines 38-45).

Re claim 10: Miller discloses, in figures 2 and 3 and throughout the disclosure, the first flexible multilayer reflector disposed between the LED (12) and the layer of phosphor material (36).

Re claim 11: Miller discloses the first flexible multilayer reflector reflects visible light and transmits UV light or blue light (column 6, lines 17-18; column 6 line 42).

Re claim 14: Miller discloses, in figures 2 and 3 and throughout the disclosure, the layer of phosphor (36) is coated on the first flexible multilayer reflector (32,34).

Claims 3,7 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller and Fleming.

Miller and Fleming show all the limitations as shown above. Including a phosphor layer (36) taught by Miller.

However, they are silent as to the exact method used to attach the phosphor layer to the multilayer film.

One of ordinary skill in the art would recognize that a phosphor material comprising an adhesive, a phosphor material comprising a binder and an adhesive disposed between the phosphor material and the first reflector are obvious variations of attaching the phosphor layer to the first multilayer film.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a phosphor material comprising an adhesive, a phosphor material comprising a binder or an adhesive disposed between the phosphor material and the first reflector because it allows for secure attachment of the phosphor layer to the multilayer reflector while not impeding the phosphor material from converting emission wavelengths into visible wavelengths.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller and Fleming as applied to claim 1 above, and further in view of Weber et al. ("Giant Birefringent Optics in Multilayer Polymer Mirrors" hereinafter Weber).

Miller and Fleming teach all the limitations as shown above, including a first and second thermoplastic polymer.

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However, they fail to teach or fairly suggest at least some of the layers are birefringent.

Weber discloses the use of birefringent layers within a multilayer polymer mirror.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include birefringent layers within the device of Miller and Fleming because the birefringent layers increase the reflectivity of the reflector while the incident angle increases thereby minimizing the amount of excitation light that is reflected back into the device.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller and Fleming as applied to claim 1 above, and further in view of Schrenk (US Patent 5,540,978).

Miller and Fleming teach all the limitations as shown above, including the reflector comprising polymeric material.

However, they fail to teach or fairly suggest a non-planar flexible multilayer reflector that comprises a polymeric material that resists degradation when exposed to U.V. light.

Schrenk discloses the use of a flexible multilayer reflector comprising polymeric material that resists degradation when exposed to U.V. light within a light device (column 2, lines 62-66).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the multilayer reflector of Schrenk in the device taught

by Miller and Fleming because it maximizes the life of the reflector thereby maximizing the life of the device.

Claims 1,2,5,6,7,10,11,12,13,16,17,18,19 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vriens et al. (US Patent 5,813,753; hereinafter Vriens) in view of Fleming.

Re claim 1: Vriens discloses, in figures 3 and 4 and throughout the disclosure, a light source comprising:

- an LED (41) that emits excitation light;
- a first multilayer reflector (37;47) that reflects at least a portion of visible light and transmits the excitation light (column 5, lines 6-7; column 5, lines 51-53); and
- a layer of phosphor material (phosphor grains) adjacent the multilayer reflector, the phosphor material emitting visible light when illuminated with excitation light.

Vriens further discloses the multilayer reflector comprised of alternating layers of high and low refractive material.

However, Vriens fails to teach or fairly suggest the multilayer reflector being flexible.

Fleming teaches the substitution of a flexible polymeric multilayer reflector for that of a reflector comprised of alternating layers of high and low refractive material (column 2, lines 5-8; column 6, lines 21-39; column 8, lines 1-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the reflector of Fleming for that of Vriens because it reduces the cost of the reflector when higher refractive indices are unnecessary.

Re claim 2: Fleming discloses the flexible multilayer reflector comprising polymeric material (column 5, line 17).

Re claims 5 and 6: Vriens discloses the excitation light to comprise UV/blue light (column 3, line 19).

Re claim 7: Vriens discloses the phosphor material further comprising a binder material (35;45).

Re claim 10: Vriens discloses, in figure 4 and throughout the disclosure, the first multilayer reflector (47) disposed between the LED (41) and the layer of phosphor material (44).

Re claim 11: Vriens discloses the first multilayer reflector reflects visible light and transmits UV light or blue light (column 5, lines 6-8).

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Re claim 12: Vriens discloses, in figure 3 and throughout the disclosure, the layer of phosphor material (34) disposed between the LED (31) and the first multilayer reflector (37).

Re claim 13: Vriens and Fleming show all the limitations as shown above.

However, they fail to teach or fairly suggest the multilayer reflector reflects yellow or red and transmits UV, blue or green light.

It is well known in the art that reflectors are tunable, meaning that the desired wavelengths reflected are dependent upon the desired output and the materials selected to manufacture the reflector to produce that output.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute a reflector that reflects yellow or red for the reflector of Vriens and Fleming because it would allow for better conversion of emission light into visible light thereby reducing the amount of phosphor necessary in the device.

Re claim 16: Vriens discloses, in figures 3 and 4 and throughout the disclosure, the layer of phosphor material (phosphor grains) is a discontinuous layer of phosphor material.

Re claim 17: Vriens discloses, in figures 3 and 4 and throughout the disclosure, the layer of phosphor material is a plurality of dots of phosphor material (34;44).

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Re claim 18: Vriens and Fleming show all the limitations as shown above.

Vriens further discusses the importance of the size of the phosphor grain that is selected (column 3, lines 35-37).

However, Vriens and Fleming fail to teach or fairly suggest each dot having an area of less than $10,000\mu\text{m}^2$.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute a phosphor dot having an area of less than $10,000\mu\text{m}^2$ within the device disclosed by Vriens and Fleming because it maximizes the conversion of UV/blue light into visible light using a minimum amount of phosphor.

Re claim 19: Vriens discloses the plurality of dots comprise phosphor material that emits red, green and blue light when illuminated with excitation light (column 3, lines 52-56).

Re claim 26: Vriens discloses at least a first phosphor dot emitting light at a first wavelength and a second phosphor dot emitting light at a second wavelength different than the first wavelength (column 3, lines 54-55).

Claims 1 and 20,21,22,23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vriens (US Patent 4,882,617) in view of Vriens '753 and Fleming.

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Re claims 1 and 20: Vriens '617 discloses, in figures 5,6 and 8, discloses a light source, comprising:

- a source (2) that emits UV radiation (column 8, line 30);
- a first multilayer reflector (22) that reflects at least a portion of visible light and transmits the UV light (column 5, line 68-column 6, line 2);
- a layer of phosphor material (18) adjacent the first multilayer reflector, the phosphor material emitting visible light when illuminated with the UV radiation; and
- a multilayer interference reflector (23),
 - wherein the layer of phosphor material is disposed between the first flexible multilayer reflector and the multilayer interference reflector.

However, Vriens '617 fails to teach or fairly suggest the source that produces the UV radiation to be an LED.

Vriens '753 discloses a UV radiation source to be an LED (41).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the LED for the UV source of Vriens '617 because it reduces the size of the device while still producing UV radiation.

Vriens '617 further discloses the first multilayer reflector comprised of alternating layers of TiO_2 and SiO_2 (column 7, lines 37 and 41).

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However, Vriens '617 fails to teach or fairly suggest the first multilayer reflector being flexible.

Fleming teaches the substitution of a flexible polymeric multilayer reflector for that of a reflector comprised of alternating layers of high and low refractive material (column 2, lines 5-8; column 6, lines 21-39; column 8, lines 1-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the reflector of Fleming for that of Vriens '617 and '753 because it reduces the cost of the reflector when higher refractive indices are unnecessary.

Re claim 21: Vriens '617 discloses the interference reflector reflects the excitation light onto the phosphor material and transmits the visible light (column 6, lines 8-13).

Re claim 22: Vriens '617 and '753 and Fleming show all the limitations as shown above.

However, they fail to teach or fairly suggest the multilayer reflector reflects yellow or red and transmits UV, blue or green light.

It is well known in the art that reflectors are tunable, meaning that the desired wavelengths reflected are dependent upon the desired output and the materials selected to manufacture the reflector to produce that output.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute a reflector that reflects yellow or red for the reflector of Vriens and Fleming because it would allow for better conversion of emission light into visible light thereby reducing the amount of phosphor necessary in the device.

Re claim 24: Fleming discloses the first flexible multilayer reflector is a polymeric material substantially free of inorganic materials (column 7, lines 38-45).

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vriens '617 and '753 and Fleming as applied to claims 1 and 20 above, and further in view of Schrenk (US Patent 5,540,978).

Vriens '617 and '753 and Fleming teach all the limitations as shown above, including the reflector comprising polymeric material.

However, they fail to teach or fairly suggest a non-planar flexible multilayer reflector that comprises a polymeric material that resists degradation when exposed to U.V. light.

Schrenk discloses the use of a flexible multilayer reflector comprising polymeric material that resists degradation when exposed to U.V. light within a light device (column 2, lines 62-66).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the multilayer reflector of Schrenk in the device taught

by Vriens '617 and '753 and Fleming because it maximizes the life of the reflector thereby maximizing the life of the device.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vriens '617 and '753 and Fleming as applied to claim 1 and 20 above, and further in view of Weber et al. ("Giant Birefringent Optics in Multilayer Polymer Mirrors" hereinafter Weber).

Vriens '617 and '753 and Fleming teach all the limitations as shown above, including a first and second thermoplastic polymer.

However, they fail to teach or fairly suggest at least some of the layers are birefringent.

Weber discloses the use of birefringent layers within a multilayer polymer mirror.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include birefringent layers within the device of Vriens '617 and '753 and Fleming because the birefringent layers increase the reflectivity of the reflector while the incident angle increases thereby minimizing the amount of excitation light that is reflected back into the device.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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- US Patent 6,472,765 discloses the dispersion of phosphor to be greater at the apex of the LED and less at the edges.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Keaney whose telephone number is (571)272-2489. The examiner can normally be reached on Monday,Tuesday,Thursday,Friday 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571)272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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